

United for Resilience: Preventing Critical Mission Utility Disruptions across the Department of the Air Force

By the Office of Energy Assurance

The United States Air Force officially became its own service Sept. 18, 1947. Before that time, the Army held responsibility for land-based operations while the Navy and Marine Corps oversaw arial operations conducted from the sea. The formation of the Air Force represented the unification of air missions under one service, recognizing the importance of the skies to the defense of the homeland. Almost 75 years later the Air Force added the Space Force to its operations in recognition that its mission reached beyond the skies and into the stars. The Department of the Air Force (DAF) was formed.

The words may have changed over the years, but the mission of the DAF has remained the same: to protect the homeland from our adversaries. A constant in achieving that mission, whether Airmen were piloting prop planes, stealth bombers, or rockets, has been the need for stable and reliable support from ground installations. Without these guiding facilities, even the most advanced arial technologies face challenges which jeopardize mission success. This is why the DAF, through a unity of effort between the Secretary of the Air Force Installations, Environment, and Energy (SAF/IEE), the Air Force Installation and Mission Support Center (AFIMSC), the Air Force Civil Engineer Center (AFCEC) and the Air Force Office of Energy Assurance (OEA), is actively working to ensure resilience on land so missions can succeed in the sky.

The DAF defines energy resilience as the ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from energy disruption. As water scarcity increases in some regions across the U.S., the DAF also recognizes the challenges of water resilience, defined as the reliable ability to access an adequate quantity and quality of water to meet mission requirements, while also mitigating water-related risks to mission success (AFPD 90-17). DAF installations face resilience threats from malicious human actors, utility outages, climate change and natural disasters.

Most recently, Americans witnessed the potentially devastating impact of unexpected weather patterns on electrical systems. Texas and other South Central states faced unprecedented low temperatures when winter storms swept across the U.S. in February 2021, causing nearly week-long electrical failures across the Energy Reliability Council of Texas (ERCOT). In addition to the hardships faced by our communities who lose power during a weather event, a long utility outage represents a significant threat to

mission continuity for DAF installations which could result in a ripple effect across the globe.

The abnormally extreme cold and snowfall which occurred in the February storm curtailed or completely stopped production at many natural gas, coal, solar, wind and nuclear power stations. While each of these technologies successfully generate power in regions where such extreme temperatures and snow accumulations are normal, energy systems are designed to operate under expected conditions. Generation assets require additional features to be resilient in extremely cold climates, which, understandably, were not designed into the systems housed in normally warm Texas. For example, power plants in cold environments consider heated fuel storage locations and winterization of fuel distribution infrastructure. Solar and wind assets deployed in cold climates are equipped with heating elements for panels and blades respectively to prevent accumulation of ice and snow. Diesel generators use special fuel additives and block heaters to operate in extremely cold climates. Cold conditions reduce the battery life and duration for backup power supply, so these systems must be insulated and climate controlled when the potential for cold exposure exists.

The SAF/IEE, AFIMSC, AFCEC and OEA have been working together to ensure resilience across the DAF for several years, and the organizations are already taking the resilience lessons learned from the ERCOT outage into consideration as they continue their resilience push. The team of energy professionals at OEA serve as energy and water resilience experts and unify the efforts across the DAF. Through holistic, data-driven analyses, OEA connects stakeholders with resilience solutions that align with the installation energy vision of Mission Assurance through Energy Assurance. OEA works with, and aligns to, stakeholders to develop executable project concepts. SAF/IEE, in coordination with the Air Force Directorate of Civil Engineers (AF/A4C), develops the enterprise strategies and resilience priorities. AFCEC and its OEA division work with the installation, through the Installation Energy Plans, to select facility energy and water projects. AFCEC serves as the execution agent for those projects. Further, SAF/IEE conducts Energy Resilience Readiness Exercises (ERREs), also known as a “pull-the-plug” exercises, to assess backup power assets and uncover capability and performance gaps which inform planning and investment priorities to maintain installation readiness. AFIMSC provides resource advocacy for all of these efforts.

The DAF is technology agnostic and develops solutions based on mission needs. The technology selected is based on its ability to best meet mission requirements. These selections consider an installation’s geographical location and climate profile, specifically designing systems to be resilient in that climate and to be prepared for extreme conditions. With this focus on finding the best solution for each of its unique installations, the DAF also evaluates innovative ideas for resilience solutions.

For example, the DAF views micro-reactors as a promising technology able to ensure energy resilience and reliability at its installations. Micro-reactors are capable of supplying energy to a wide range of Department of Defense installations and are particularly well suited to power and heat remote domestic military bases that are a critical part of the national security infrastructure. SAF/IEE and OEA recently released a Request for Information (RFI) to industry related to micro-reactor technologies and see significant potential in this area. OEA strives for unity of effort by connecting DAF enterprise and installation stakeholders with energy and water resilience partners, emerging technologies and industry best practices. As such, OEA plans to release additional RFIs in the future to bring the innovation of industry into the DAF resilience program.

Today, we view energy systems through a resilience lens. The freezing conditions Texas experienced were far beyond any witnessed in the past decade – and certainly were not anticipated when the generation assets that caused the extended outages were designed. However, like the DAF itself, installation resilience strategies will continue to evolve to meet the emerging challenges facing our installations. The mission in the sky and space will be assured through our efforts on the ground.